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ABSTRACT

This study is part of a program designed to attempt identification of dissonance through components of electrophysiological instrumentation, for measuring and presenting to a person some of his own unconscious dissonance, of which he is normally unaware. Using college students as subjects, the authors used attitude ratings on values to attempt to induce in them feelings of self-dissatisfaction about specific values and attitudes and then measure attitude change. Their findings include indications that subjects could learn relaxation of muscle tension to low levels quite easily with biofeedback methods; further, biofeedback enabled subjects to maintain a lower arousal state, making them less susceptible to overreaction because of dissonance. A further study was designed to test whether it was possible through biofeedback training to control the internal states of dissonance and thereby control attitude change. Overall results indicated that such feedback training in control of muscle activity helped the subject to maintain a state of calm during a "dissonance" experience; therefore, he was not prone to change his behavior. (Author/RN)

BIOFEEDBACK: AN OPERATIONAL DEFINITION AND CONTROL OF DISSONANCE

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This study was part of a program designed to attempt identification of dissonance by means of specific components of EEG and EMG activity. It was believed, or at least hypothesized, that any dissonance that could be detected and displayed in an objective fashion to the subject, could be self-regulated in some degree. Since anxiety, using muscle tension or brain waves, had already been self-regulated through training in a number of laboratories[1] we were interested in the possibility of using electrophysiological instrumentation for measuring and presenting to a person some of his own unconscious dissonance - that was, dissonance of which a person was normally unaware.

Method for Inducing Dissonance

Using the Rokeach method,[2] we tried to induce in all the subjects feelings of self-dissatifaction about specific values and attitudes, and then measured their attitude change with the semantic differential. First, we asked them to rank 18 instrumental values (Form E). We then asked members of all groups to rate the concept "airline hyjacking" on six bi-polar adjective scales. Members of the groups then viewed a chart showing the importance of values as ranked in previous tests (Oct. 1971) at BYU by 300 BYU students.

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[1] B. B. Brown, "Recognition of Aspects of Consciousness through Association with EEG Alpha Activity Represented by a Light Signal," Psycholphysiology, 6 (1970), 442-452; T. H. Budzynski et. al., "Feedback-induced Muscle Relaxation: Application to Tension Headache," Behavior Therapy and Experimental Psychiatry, 1 (1970), 205-211.

[2] M. Rokeach, Beliefs, Attitudes, and Values, (San Francisco: Jossey-Bass, 1968), p. 170.

This chart gave the average rankings for BYU students in one column and in another column the rankings of a convicted hyjacker. (This hyjacker just happened to be one of the subjects in the previous experiment just a few months before he actually skyjacked a United Airlines' jet; therefore the data were the actual truth and not fabricated for experimental purposes.) We invited them to compare their own value rankings with their peers and the hyjacker.

We then asked them to compare their own attitude ratings toward the concept "airline hyjacking" with those of their peers at BYU. To raise levels of self-dissatisfaction further we asked them to read the statement: "If your attitude (or values) varies from the average on Chart I and/or II, we interpret these differences to mean that there are inconsistencies within your own value-attitude system."

After this, the students again rated the concept "airline hyjacking" on the evaluative scale.

An Operational Definition

We knew that dissonance was often extremely difficult to operationally define, and when the researcher said, "We exposed the subject to information designed to make him consciously aware of inconsistencies..." he did not help the definition much. Generally, the definition was followed by an inference of dissonance from attitude change.

We differed in our definition and measurement of dissonance. We were suggesting that when the subject compared his rankings as similar with the hyjacker and different from the average BYU student his muscle and/or brain

wave activity would change. Internal psychological inconsistency would affect his tissue cells and that could be "seen" and recorded in muscle tension or brain wave activity.

One of our first attempts at using biofeedback machines in defining and controlling dissonance, involved alpha waves. We assumed, based on Kamiya's work,[3] that the absence of alpha might be useful as an indicator of dissonance. In agreement with Kamiya, we found when a subject was given immediate feedback as to the presence of alpha he was able to gradually increase his alpha level. And quite encouraging, he could do this with his eyes open and while talking. As Kamiya indicated, the subject said the alpha waves were present a greater per cent of the time under relaxed conditions. He also reported that it helped to concentrate in a passive way and that visualization would immediately suppress the alpha condition.

Unfortunately, as soon as the subject began visualizing any reading material the alpha rhythm disappeared. Consequently, it was not possible to use alpha as an indicator of dissonance during visualization of reading material. In the hope of resolving this shortcoming present with alpha feedback, we turned our attention to muscle tension.

With one group of college students (N=14), we did not use the EMG to measure the degree of muscle activity. Instead, we relied on our visual perception of observable cues such as raised eyelids, tight jaw, etc. and the subjective report of the subject. We found that it was not uncommon

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[3]J. Kamiya, "Conscious Control of Brain Waves," Psychology Today, 1 (1968), 57-60.

for a subject to look relaxed in reading the material when, in fact, he reported a high level of tension.

In our next group (N=14), we conjectured that this difficulty could be largely overcome with an EMG system. The basic technique was to detect accurately the level of tension in the muscles during the reading of Charts I and II. This necessitated continuous monitoring of EMG levels as well as their quantification on a step-by-step basis during the entire reading. Without exception, when the subject from this group compared his rankings as similar with the hyjacker and different from the average BYU student his tension level jumped over 10 microamperes.

In the third group (N=14), biofeedback technique was used. In effect, the task of the subject, who had EMG electrodes applied to the surface of the skin over the frontalis muscle and who heard the feedback tone through his headphones, was to keep the tone at a low frequency by relaxing. As soon as the subject reported relaxation he was instructed to read Charts I and II. When the subject noticed the feedback slightly rising, he relaxed until the feedback indicated a return to baseline level. In order to qualify for this group, the subject, during his reading, held his forehead tension at the low level on the medium scale.

A tentative summary of our findings with 42 subjects over a period of two months indicated that:

1. Relaxation of muscle tension to low levels is quite easy to learn with feedback of EMG signals.

2. Dissonance susceptibility (counter norm in attitude or values) and high EMG rhythm seems to be positively related with subjects without

feedback training.

3. Biofeedback enables the subject to maintain a more normal (lower) arousal state such that he is less susceptible to overreaction due to dissonance.

It should be noted that due to various methodological difficulties these findings were only suggestive. We therefore conducted the following study.

Control of Dissonance

This study was designed to test whether it was possible through biofeedback training to control these internal states and thereby control attitude change. Stated in null form, the three hypotheses were:

1. H_o: There are no significant differences in attitude change among the various methods.

2. H_o: There are no significant differences in attitude change due to sex.

3. H_o: There are no significant differences for the interaction between sex and method.

This study utilized a 2x3 factorial design with sex as the additional factor and initial attitudes as a covariate. Students from classes at the BYU served as subjects. On the basis of their initial scores, 78 subjects were assigned on a random basis to one of the three methods described earlier. Also the method for inducing dissonance for all three groups was the same as the method described in the earlier research. Since the method was designed to be counternorm, only subjects who scored eight or above on the pretest (indicating a counter attitude toward their peer group) were included in the analysis of data.

Analysis of covariance was applied to determine whether there were significant differences; this analysis was summarized in Table I. The F ratio in this table provided a test of the three hypotheses, after the scores were adjusted for the original attitudes. The critical value for a .05 level test in this case was F (2, 73)=3.13. Thus the data indicated statistically significant differences among the methods.

It was then justifiable, irrespective of the value of the F ratio, to compare method one with methods two and three combined. All three methods related to the effect of internal inconsistancies on attitude change, and that methods two and three were unique in that they involved no biofeedback. The full analysis was set out in Table II.

Since the F ratios have indicated real differences among the adjusted means, the significance of the differences between any two group means was tested by the t ratio. The adjusted means and t values were given in Table III. The critical value of t at the .05 level of this two-tailed test with 51 degrees of freedom was 2.01. Since the observed value of t (2.62) did fall in the critical region, null hypothesis 1 was rejected. The group receiving no biofeedback training changed attitudes significantly more than the group with biofeedback training.

Discussion

The overall results demonstrated that the Rokeach method of inducing dissonance to change attitudes had a decided effect on subjects without training in biofeedback. To explain the results, the following proposition was advanced: training in feedback control of muscle activity proved successful in helping a subject to maintain a state of calm during a "dissonance" experience and therefore he was not prone to change his behavior.

Attitude change research seems to have been heavily centered on the manipulation of sender and message factors which attempt to cause or create differences in persuasive effect. This research has implications for a receiver-oriented approach. With the heightened concern for the consumer in our society, communication scholars might well give some thought to people as consumers of information and persuasive attempts. Millions of Dollars are spent daily in the creation of persuasive messages. As the persuader gets more sophisticated little help is given to the receiver to help him deal with the onslaught.

The research reported here tentatively suggests that receivers may have within them the power to resist and even neutralize the effect of manipulative persuasive attempts.

TABLE I

Analysis of covariance - deviations from regression

Source of variation	Sum of squares (adjusted)	Degrees of freedom	Mean square	F
Exp. error	287.6291	71	4.0511	
Methods (A)	316.1768	73		
Difference	28.5476	2	14.2738	3.52*
Sex (B)	288.4135	72		
Difference	0.7844	1	0.7844	0.19
A x B	303.1967	73		
Difference	15.5675	2	7.7837	1.92

TABLE II

Further analysis of the data in Table I

Source of variation	Sum of squares (adjusted)	Degrees of freedom	Mean square	F
Between groups 1 and groups 2,3	24.9000	1	24.90	6.15*
Within groups	303.8250	75	4.05	
Total	328.7250	76		

TABLE III

Values of t and the three adjusted means

	Biofeedback mean=9.979	No feedback-no EMG mean=9.041
No feedback-EMG mean=8.478	t=2.62*	t=0.99
Biofeedback mean=9.979		t=1.68

CHART 1

IMPORTANCE OF VALUES AS RANKED
IN PREVIOUS TESTS

B.Y.U. Students		Richard McCoy
10	Ambitious	5
15	Broadminded	18
7	Capable	13
9	Cheerful	6
17	Clean	15
8	*Courageous	2
3	Forgiving	8
6	Helpful	7
1	*Honest	9
13	Imaginative	14
18	*Independent	3
14	Intellectual	10
16	Logical	11
4	Loving	4
12	Obedient	16
11	Polite	1
2	*Responsible	12
5	*Self-controlled	17

This chart shows the average rankings of the 18 instrumental values obtained from students in a previous experiment (Oct. 1971) conducted at this university. (Richard McCoy just happened to be one of the subjects in the previous experiment, therefore the data are the actual truth and not fabricated for experimental purposes.) We draw your attention especially to the data concerning five of the 18 values shown in the chart--Courageous, Honest, Independent, Responsible, Self-controlled.

We interpret these findings to mean that Richard McCoy was much more likely to "skyjack" or commit some similar act than the average B.Y.U. student. We invite you to compare your own value rankings with those of your peers.

Also we invite you to compare your own attitude toward the concept "skyjacking" with those of your peers at B.Y.U.

CHART 2

intelligent	___ ___ ___ ___ ___ ___ X	stupid
wrong	X ___ ___ ___ ___ ___ ___	right
healthy	___ ___ ___ ___ ___ ___ X	sick
good	___ ___ ___ ___ ___ ___ X	bad
awful	X ___ ___ ___ ___ ___ ___	nice
righteous	___ ___ ___ ___ ___ ___ X	sinful

If your attitude (or your values) varies from the average on Charts 1 and 2, we interpret these differences to mean that there are inconstencies within your own value-attitude system, inconsistencies of which you are consciously and normally unaware.